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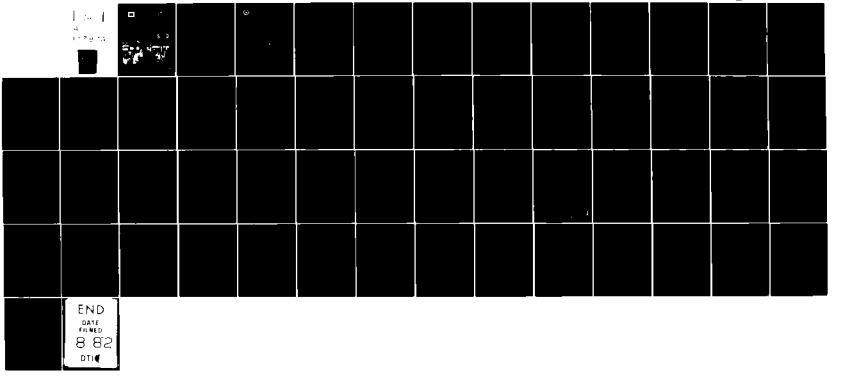

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TECHNICAL REPORT Y-78-6

PRELIMINARY GUIDE TO THE ONSITE IDENTIFICATION AND DELINEATION OF THE WETLANDS OF THE INTERIOR UNITED STATES

Environmental Laboratory
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

May 1982
Final Report

Prepared for Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

PRELIMINARY GUIDE TO WETLANDS

Major Associations and Communities Identified

Technical Report No.	Region
Y-78-2	Peninsular Florida
Y-78-3	Puerto Rico
Y-78-4	West Coast States
Y-78-5	Gulf Coastal Plain
Y-78-6	Interior
Y-78-7	South Atlantic States
Y-78-8	North Atlantic States
Y-78-9	Alaska

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DEPARTMENT OF THE ARMY
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P. O. BOX 631
VICKSBURG, MISSISSIPPI 39180

IN REPLY REFER TO:

WESEV

1 June 1982

SUBJECT: Transmittal of Technical Report Y-78-6

TO: All Report Recipients

The report transmitted herewith provides preliminary technical guidance on the onsite identification and delineation of wetlands to Corps of Engineers personnel responsible for the implementation of Section 404 of the Clean Water Act in the Interior United States. This guide, sponsored by the Office, Chief of Engineers, U. S. Army, represents one of a series of eight guides to the wetlands of the United States. Other guides include Alaska, peninsular Florida, Puerto Rico, West Coast States, Gulf Coastal Plain, North Atlantic States, and South Atlantic States.

TILFORD C. CREEL
Colonel, Corps of Engineers
Commander and Director

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This guide to the major plant associations and communities found in wetlands within the Interior region of the U. S. is one of a series of eight such guides, each prepared by a specialist or specialists familiar with the wetlands in the region covered by the guide. The guides are intended for distribution to the various U. S. Army Engineer Districts for use in the onsite technical identification and delineation of wetlands. The classification system in this

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20. ABSTRACT (Continued).

guide is adapted from that utilized by the National Wetland Inventory (NWI) Project of the U. S. Fish and Wildlife Service, but frequently departs from NWI's system to describe common and/or distinct wetland communities or associations.

SUMMARY

This report represents one of a series of eight preliminary guides to the dominant plant associations and communities found in the major wetlands of the United States. The purpose of this guidebook is to aid Regulatory personnel with the onsite technical recognition and geographic delineation of wetland boundaries. This guidebook is designed to be self-contained and consists of three parts. An introduction covers the objectives and use of the guidebook as well as general information about wetlands. The second part, entitled "Wetlands of the Interior United States," consists of five major sections: Regional Environment, Values, Wetland Vegetation, Wetland Soils, and Wetland Hydrology. The third part covers Regional Wetland Types.

PREFACE

At the request of the Office, Chief of Engineers, the Environmental Laboratory (EL) of the U. S. Army Engineer Waterways Experiment Station (WES) initiated production of a series of regional guidebooks designed to aid regulatory personnel with the onsite technical recognition and delineation of wetland boundaries. This report, which pertains to wetlands of the Interior United States, is, therefore, one of a series of eight preliminary guidebooks to the wetlands. Other reports in the series apply to Alaska, Puerto Rico, West Coast, Gulf Coast, North Atlantic, South Atlantic, and peninsular Florida. The reports are listed on the inside of the front cover.

Initial efforts to develop this preliminary guide were made by Mr. Gerard S. Wilhelm, Morton Arboretum, Lisle, Ill., under Purchase Order No. DACW39-76-2472. Mr. Richard H. Daley, Ecologist, Missouri Botanical Garden, St. Louis, Mo., under Purchase Order No. DACW39-77-5173, developed an initial technical base to be used for the preparation of this report. This effort was under the technical supervision of Dr. Luther F. Holloway, EL. Development of this report was under the technical direction of Dr. Robert T. Huffman, Research Botanist, EL.

The guide project was conducted under the general supervision of Dr. Hanley K. Smith, Ecologist, Environmental Resources Division (ERD), EL; Dr. Conrad J. Kirby, Chief, ERD; Mr. Charles C. Calhoun, Program Manager, Dredging Operations Technical Support Program, EL; and Dr. John Harrison, Chief, EL.

The Commanders and Directors of WES during the study were COL George H. Hilt, CE, COL John L. Cannon, CE, and COL Nelson P. Conover, CE. Technical Director was Mr. Fred R. Brown.

This report should be cited as follows:

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CONTENTS

PRELIMINARY GUIDE TO THE ONSITE IDENTIFICATION AND DELINEATION OF THE WETLANDS OF THE INTERIOR UNITED STATES

PART I: INTRODUCTION

Background

1. Under the various laws of the United States, Congress has assigned a number of nonmilitary functions to the U. S. Army Corps of Engineers. In addition to the more traditional roles in flood control, hydropower production, navigation, water supply storage, and recreation, the Corps has regulatory authority for the control of the discharge of dredged or fill material into waters of the United States. The primary legislative basis for the Corps' regulatory authority and subsequent program is the Clean Water Act. Section 404 of the Clean Water Act gives authority to the Secretary of the Army, acting through the Chief of Engineers, to regulate the discharge of dredged or fill material in the waters of the United States.

2. The objective of the above-described legislation is to maintain and restore the biological, physical, and chemical integrity of the Nation's water quality through regulation of the discharge of dredged and fill material into "Waters of the United States." "Waters of the United States" has broad meaning and incorporates both aquatic and wetland ecosystems, and includes the following (Federal Register 1977):

a. The territorial seas with respect to the discharge of fill material.

b. Coastal and inland waters, lakes, rivers, and streams that are navigable waters of the United States, including their adjacent wetlands.

c. Tributaries to navigable waters of the United States, including adjacent wetlands.

d. Interstate waters and their tributaries, including adjacent wetlands.

e. All other waters of the United States not identified above, such as isolated wetlands and lakes, intermittent streams,

prairie potholes, and other waters that are not a part of a tributary stream to interstate waters or navigable waters of the United States, the degradation or destruction of which could affect interstate commerce.

3. The Federal Register (1977) defines wetland ecosystems as:

> Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Objective

4. The objective of this report is to present information that can assist regulatory personnel with the onsite technical identification and geographic delineation of wetland boundaries. The approach taken by this report is, therefore, to describe the diagnostic environmental characteristics of wetland ecosystems and provide the user with a general description of the wetland types of the Interior United States.

Wetland Identification and Boundary Determinations

5. Definition of jurisdictional limits is of obvious importance to any regulatory program. However, legislation authorizing the Corps' Section 404 Regulatory Program provided little guidance, except in a broad context, regarding the technical identification and geographic delineation of areas subject to jurisdiction. This is especially true in determining the landward extent of wetland areas.

6. Presently, the delineation of landward jurisdictional authority lies in the technical identification of ecosystems that have two key environmental characteristics:

a. Inundated or saturated soil conditions that are the result of periodic or permanent inundation by groundwater or surface water.

b. A prevalence of vegetation typically adapted for life in inundated or saturated soil conditions.

Often these characteristics can be readily identified in the field;

however, field personnel are cautioned not to rely solely on vegetation, but to look for indicators of wetland soil and hydrology conditions such as those outlined by paragraphs 13 and 15. Evidence of one or more indicators of wetlands soil and hydrologic condition will demonstrate a logical, as well as easily defensible, technical tie to why the vegetation is considered to be characteristic of wetland ecosystems for the particular situation of concern. Many wetland species can be found growing successfully in both wetland and nonwetland habitats. Combined use of wetland vegetation, soil, and hydrologic indicators can, therefore, greatly enhance the technical accuracy, consistency, and credibility of wetland determinations, particularly within the transition zone between wetland and nonwetland ecosystems.

PART II: WETLANDS OF THE INTERIOR UNITED STATES

Regional Environment

7. The Interior United States (Figure 1) is a vast area with diverse physiognomy, climate, and natural vegetation. Bailey (1978) described six second-order ecoregions which cover the Interior United States. The general environmental characteristics of these ecoregions are described in Table 1.

Figure 1. Guidebook Regions

Table 1

Environmental Characteristics of Second-order Ecoregions of the Interior United States (Bailey 1978)

Ecoregion	Temperature	Rainfall	Type of Vegetation
Warm continental	Coldest month below 0°C, warmest month <22°C	Adequate throughout the year	Seasonal forests, mixed coniferous-deciduous forests
Hot continental	Coldest month below 0°C, warmest month >22°C	Summer maximum	Deciduous forests
Subtropical	Coldest month between 18°C and -3°C, warmest month >22°C	Adequate throughout the year	Coniferous and mixed coniferous-deciduous forest
Prairie	Variable	Adequate all year excepting dry years, maximum in summer	Tall grass, parklands
Steppe	Variable, winters cold	Rain <50 cm/yr	Short grass, shrubs
Desert	High summer temperature	Very dry in all seasons	Shrubs or sparse grasses

8. It should be noted that the natural vegetation of the Interior United States has undergone extensive alteration in recent centuries. Bottomlands of the major river valleys were largely cleared long ago and have been extensively farmed since then. Other forest lands have been harvested repeatedly and, where the cleared land was not put into seasonal agriculture, have regenerated well. The midwestern prairies have probably changed the most since much of this area has been modified for cultivation of wheat, corn, and other grain crops.

Values

9. The wetlands of the Interior United States often have certain useful attributes that make them valuable and productive resources of local, regional, or national signficance. The following is a list of values that are of notable importance:

a. Wetlands often serve as key areas for biotic productivity and cycling of nutrients associated with the formation and maintenance of food chains.

b. Wetlands provide food, cover, rest, reproduction, and nursery habitat for associated biota.

c. Wetlands typically have a major influence on drainage, salinities, flushing characteristics, current, and sedimentation patterns.

d. Certain wetlands influence surface water and groundwater recharge.

e. Many wetlands provide physical protection against erosion and storm damage.

f. Many wetlands serve as storage areas for storm and floodwaters.

g. Wetlands affect water quality variables such as dissolved oxygen, temperature, turbidity, and nutrient load.

h. Wetlands provide opportunities for recreation, education, and research.

Wetland Vegetation

10. Wetland plant species are organisms that, because of morphological adaptations, physiological adaptations, and/or reproductive strategies, have the ability to perform certain requisite life functions that enable the species to achieve maturity in an environment where the soils within the root zone become inundated or saturated permanently or periodically.

11. The determination of whether a particular plant species can be found in wetlands is made by evidence provided by any one of the indicators given below:

a. Visual observation is made of survival of plant species

in habitat conditions exhibiting any one of the wetland hydrology/soil-moisture regimes described in the following sections on wetland soils and wetland hydrology.

b. The technical literature indicates that the plant is associated with habitat conditions exhibiting any one of wetland hydrology/soil-moisture regimes described in the following sections on wetland soil and wetland hydrology.

c. The presence of morphological or physiological adaptations or reproductive strategies for survival in aquatic or wetland habitats is indicated in technical literature.

Wetland Soils

12. Wetland soils are those that become saturated permanently or periodically within the root zone during the growing season of the prevalent vegetation.

13. The determination of whether a particular soil is indicative of a wetland ecosystem can be made by finding evidence of any one of the indicators listed below:

a. There is mottling with a chroma (brightness) of 2 or less within a major part of the root zone.

b. There is a gleyed soil horizon within the root zone.

c. If there is no mottling or if mottles present have a chroma greater than 2, the soil below 25 cm has a chroma of 1 or less.

d. The soil examined has hydric soil characteristics other than a, b, or c above.

e. Presence of free water within the root zone.

f. Visual observation of soil saturation.

Wetland Hydrology

14. Wetland hydrology connotes the inundation or saturation of areas by surface water or groundwater either permanently or periodically during the growing season of the prevalent vegetation.

15. The determination of hydrologic conditions indicative of

wetlands can be made by finding evidence of any one of the indicators listed below:

a. Drainage pattern.

b. Drift lines.

c. Silt deposition on vegetation.

d. Water marks.

e. Ice scars.

f. Active water table within a major portion of the root zone.

g. Stream gage data and flood predictions.

h. Historic records.

i. Visual observation of inundation.

PART III: REGIONAL WETLAND TYPES

16. The wetland classes and definitions that follow are taken or adapted from "Classification of Wetland and Deepwater Habitats of the United States" (Cowardin et al. 1979), which was prepared for the National Wetland Inventory (NWI) Project of the U. S. Fish and Wildlife Service. The NWI classes are a secondary level of five major systems--Marine, Estuarine, Riverine, Lacustrine, and Palustrine--and eight subsystems. For the purposes of this discussion systems and subsystems are omitted. Below the class level, however, this guide will frequently depart from NWI's hierarchical classification system and describe common wetland plant communities or associations. These communities or associations are included to assist in the field identification and delineation of wetlands and do not preclude the use of NWI classification, though each of these plant communities or associations could be easily classified under this system.*

* See Appendix A for lists of common and scientific names used in this guide.

AQUATIC BED WETLANDS

DEFINITION: The Aquatic Bed Wetlands class includes areas having a prevalence of vegetation that grows principally on or below the surface of the water for most of the growing season in most years. Aquatic beds existing beyond a depth of 2 m (6.6 ft) are classified as deepwater habitats and, therefore, will not be considered in this guide.

17. Within the Aquatic Bed Wetlands class, NWI includes four subclasses: (a) Algal, (b) Aquatic Moss, (c) Rooted Vascular, and (d) Floating Vascular. These subclasses may be further divided by use of water salinity modifiers as prescribed by the NWI Classification System. Though NWI lists seven water salinity modifiers which may be utilized in wetlands classification, this guide will discuss only two broad categories of water salinity--fresh and saline. Use of recognized subclasses will, however, be retained where applicable.

Aquatic Bed Wetlands (Freshwater)

18. The Freshwater community occurs in many ponds, lakes, reservoirs, canals, streams, and rivers. The most common genera and many of the important species are widespread throughout North America. This community is usually composed of three zones--a rooted, submerged plant zone; a floating nonrooted area; and one in which the rooted plants have some parts floating on the water surface.

19. Various aquatic plants are considered problem weeds, reducing the recreational value of lakes and waterways, clogging irrigation canals and drainage ditches, and covering water surfaces. Many of these are exotic "aquarium-trade escapees" which thrive in the absence of natural predators or competitors. The luxuriant growth of some of these aquatic plants is a response to the nutrient enrichment of the water by man's activities.

Vegetation

20. Growth forms and physiognomy. This community is characterized by free-floating and submerged and floating-leaved, often rooted aquatic herbs occurring in dense, scattered stands. Large populations of filamentous algae are often found within this community.

21. Species composition of the Aquatic Bed Wetlands (Freshwater). Prevalent and common associated species include:

a. Subclass: Rooted Vascular.

Ceratophyllum demersum (Hornwort)

Elodea spp. (Waterweed)

Myriophyllum spp. (Watermilfoil)

Najas spp. (Naiads)

b. Subclass: Floating Vascular.

Lemna spp. (Duckweed)

Spirodela spp. (Duck-meat)

Environmental conditions

22. The Freshwater community usually has standing water. If the water level is temporarily lowered, many of the plants may die and if near a marsh, wetland emergents will invade shallower areas. If the habitat gradually becomes drier through soil accumulation, the Freshwater Aquatic Bed will eventually be succeeded by species characteristic of the Emergent Wetland class. If an Aquatic Bed Wetland dries too rapidly, a flat will often form. In some areas where significant fluctuations of the water level occur, Aquatic Bed Wetlands and Emergent Wetlands seasonally replace each other. However, submerged and floating plants normally do not become established unless the area is inundated for extended periods of time.

23. The central area of open water, which often occurs in Freshwater Aquatic Bed Wetlands, is often dominated by algae. The extent of the algal cover, usually a surface mat of filamentous forms, is dependent on the nutrient levels in the water, especially certain forms of nitrogen and phosphorus. High levels of nutrients and organic material favor their growth as well as phytoplankton (small free-floating algae) and periphyton (algae attached to rocks and vegetation).

Aquatic Bed Wetlands (Saline)

24. Saline communities, uncommon in much of the region, are usually sparsely vegetated. The vegetation, when present, usually occurs near the margins. Salinities or alkalinities, when in high concentrations, often exclude all but the most salt-tolerant species in this environment.

Vegetation

25. Growth form and physiognomy. This area is characterized by submerged, narrow-leaved, aquatic herbs and algae that, when present, occur frequently in dense, scattered stands.

26. Species composition of the Aquatic Bed Wetlands (Saline). Prevalent and common associated species include:

a. Subclass: Algal.

Chara spp. (Muskgrass)
Nitella spp. (Stonewort)
Tolypella spp. (Stonewort)

b. Subclass: Rooted Vascular.

Myriophyllum exalbescens (American milfoil)
Najas spp. (Naiads)
Potamogeton foliosus (Leafy pondweed)
Potamogeton pectinatus (Sago pondweed)
Ruppia maritima (Widgeon grass)
Zannichellia palustris (Horned pondweed)

Environmental conditions

27. The saline community is permanently flooded except in unusually dry years. Species which characterize this wetland type are intolerant of desiccation. When inundation is periodic, the saline Aquatic Bed Wetland is commonly replaced by an Unconsolidated Shore (vegetated) or a Saline Emergent Wetland.

MOSS-LICHEN WETLANDS

DEFINITION: The Moss-Lichen Wetlands class includes areas where mosses or lichens cover substrates other than rock and where emergents, shrubs, or trees make up less than 30 percent of the areal cover (Cowardin et al. 1979).*

28. In the Northern Midwest, Moss-Lichen Wetlands occur on acid, peaty soils and are generally referred to as bogs.

Vegetation

29. Growth forms and physiognomy. These communities are characterized by dense mats of moss (i.e., sphagnum) intermixed with an occasional forb, shrub, or tree.

30. Species composition of the Moss-Lichen Wetland. The following prevalent species are included:

Sphagnum spp. (Sphagnum moss)

The following common associated species are included:

Andromeda polifolia (Bog-rosemary)
Carex lanuginosa (Wooly sedge)
Carex lasiocarpa (Caric-sedge)
Carex rostrata (Beaked sedge)
Chamaedaphne calyculata (Leatherleaf)
Decodon verticillatus (Swamp loosestrife)
Drosera rotundifolia (Sundew)
Eriophorum spp. (Cottongrass)
Kalmia polifolia (Bog-laurel)
Ledum groenlandicum (Labrador-tea)
Menyanthes trifoliata (Buckbean)
Sarracenia purpurea (Pitcher plant)
Typha spp. (Cattails)

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* Note that areas possessing similar species composition as Moss-Lichen Wetlands, but sustaining an areal coverage of emergents, shrubs, or trees exceeding 30 percent are more properly classified as Emergent Wetlands.

31. Species associations. Sphagnum moss is the single plant genus most characteristic of bogs, forming mats over most of the substrate. Other mosses and sedges (*Carex* spp.) are found in some bogs; shrubs, mostly in the heath family, may be found growing scattered in bogs.

Environmental conditions

32. Moss-Lichen Wetlands are characterized by acidic organic soils and by ombrotrophism (most nutrients being obtained from precipitation). This community, which is rare in the Rocky Mountains, is common in the northern and eastern parts of the region, especially in Michigan, Minnesota, and Wisconsin. Even though they are occasionally associated with fens, the species composition is usually quite distinct.

EMERGENT WETLANDS

DEFINITION: The Emergent Wetlands classes are areas dominated by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants (Cowardin et al. 1979).

33. Within the Emergent Wetlands class, NWI includes two subclasses: Persistent and Nonpersistent, based on the duration of the standing vegetation through the nongrowing season. Because of the large number of wetlands encompassed by the Emergent Wetlands class in the Interior Region of the United States and the variance of persistence/nonpersistence from one geographic areas to another, this guide will describe four common plant communities to assist in field recognition: (a) Saline inland flats, (b) Saline marshes, (c) Freshwater flats, and (d) Freshwater marshes (including fens and wet meadows).

Saline Inland Flats

34. Saline flats are common only in the western part of this region. They are rare or absent in the Interior Region (east of 100° longitude) where precipitation exceeds evaporation in nearly all years. These flats are commonly found around ponds or playas (desert lakes that are flooded only for short periods) and are often highly saline or alkaline.

Vegetation

35. Growth forms and physiognomy. Saline inland flats are characterized by a scattering of halophytic herbs around nonvegetated areas.

36. Species composition of the saline inland flats. Prevalent and common associated species include:

a. High salinity or alkalinity.

Salicornia rubra (Glasswort)
Salicornia spp. (Pickleweed)
Sesuvium verrucosum (Sea purslane)

Suaeda depressa (Sea blite)

b. Lower salinity or alkalinity.

Distichlis spicata (Saltgrass)

Hordeum jubatum (Foxtail barley)

Puccinellia nuttalliana (Alkali grass)

Salsola kali (Russian thistle)

Sarcobatus vermiculatus (Black greasewood)

Sporobolus airoides (Alkali sacaton)

Tamarix spp. (Salt-cedar)

Triglochin maritima (Arrowgrass)

37. Species associations. Since only a few taxa can withstand saline or alkaline soils, the species composition of flats is relatively small. The vegetation is usually zoned and appears as a series of concentric rings (mostly of different species) around a central open area of high salinity or alkalinity. The innermost vegetated zone is often composed of halophytes such as sea purslane, pickleweed or glasswort (usually *Salicornia rubra*), and sea blite. Other species here, but on soils with somewhat reduced salt levels, include saltgrass, foxtail barley, alkali grass, arrowgrass, alkali sacaton, Russian thistle, and black greasewood. Most of these species, or closely related ones, are also found on the coastal flats. Dwarfing of the vegetation occurs commonly in these areas when the concentration of salts nears the tolerance limit for each species. (Many species reproduce vegetatively under these conditions.) Salt-cedar, an 1880's introduction into the United States, is one of the few trees which grows in this harsh environment. Here, it commonly occurs in scattered, small, dense stands composed of many dwarf individuals.*

38. Even where standing water is normally absent for much of the year, the subsoils in saline flats often remain saturated. Playas and other shallow depressions commonly fill with water following thunderstorms or after spring snowmelts.

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* Saline flats supporting salt-cedar as the dominant species would more properly be classified as Scrub-Shrub Wetland.

Saline Marshes

39. Saline marshes are relatively uncommon in the midwestern and eastern portion of the Interior region. One exception is the Big Salt Marsh of southcentral Kansas. These marshes are common in the Great Basin area, particularly in association with playas. Some are of notable size, particularly those around Great Salt Lake of Utah, the Salton Sea, California Desert, and Carson Desert of California.

Vegetation

40. Growth forms and physiognomy. These areas are characterized by dense stands of graminoids, with occasional scattered shrubs and forbs.

41. Species composition of the saline marsh. The following prevalent species are included;

Distichlis spicata (Saltgrass)
Eleocharis rostellata (Spikesedge)
Hordeum jubatum (Foxtail barley)
Scirpus americanus (Threesquare bulrush)
Scirpus maritimus (Saltwater bulrush)
Scirpus robustus (Bulltule)
Spartina pectinata (Prairie cordgrass)
Sporobolus airoides (Alkali sacaton)

The following common associated species are included:

Allenrolfea occidentalis (Iodine bush)
Salicornia spp. (Pickleweed)
Sesuvium verrucosum (Sea purslane)
Suaeda depressa (Sea blite)
Tamarix spp. (Salt-cedar)

Environmental conditions

42. Saline marshes in the region are subject to seasonal and annual variations in water levels. The soils often remain moist for extended periods even when there is no standing water.

Freshwater Flats

43. Freshwater flats occur throughout the Midwest and Southwest along rivers, drainageways, playas, and reservoirs. In the Midwest, flats are most common along larger rivers (such as the Mississippi), the drawdown areas of reservoirs, river islands, and sandbars. In addition, dredged material deposited near the water table often becomes a site for flat development.

Vegetation

44. Growth form and physiognomy. Freshwater flats are characterized by scattered communities of rooted, emersed herbs and sparsely scattered shrubs and trees.*

45. Species composition of the freshwater flat. Prevalent and common associated species include:

Ambrosia trifida (Giant ragweed)
Cyperus esculentus (Yellow nutgrass)
Eragrostis hypnoides (Creeping love-grass)
Helianthus annuus (Annual sunflower)
Ipomoea lacunosa (Small white morning-glory)
Mimulus ringens (Monkey flower)
Mollugo verticillata (Carpetweed)
Salix spp. (Willow)

46. Species associations. Reservoir drawdown areas often have giant ragweed and annual sunflower as dominants. Flats in the Southwest and Midwest are similar in low total vegetative cover, but the Southwest flats differ in their occurrence along drainageways and playas not adjacent to surface water.

Environmental conditions

47. Freshwater flats are characterized by periodic inundation. In the Midwest, flooding usually occurs during later winter and spring.

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* Freshwater flats supporting shrubs or trees (i.e., *Salix* spp.) as the dominant species would more properly be classified as Scrub-Shrub Wetlands.

Freshwater Marshes (Including Fens and Wet Meadows)

48. In the higher elevations of the Rocky Mountains, freshwater marshes found on organic soils are called fens, while those found on mineral soils are called wet meadows. In the Midwest, freshwater marshes adjacent to streams, canals, rivers, ponds, reservoirs, lakes, and around prairie potholes are classified as Palustrine.* Freshwater marshes are not common in the Southwest.

Vegetation

49. Growth forms and physiognomy. These communities are characterized by dense stands of graminoids and graminoid-like species intermixed with an occasional forb.

50. Species composition of the freshwater marshes. For fens and wet meadows, the following prevalent and common associated species are included:

Calamagrostis canadensis (Bluejoint)
Caltha leptosepala (Marsh marigold)
Carex aquatilis (Water sedge)
Carex rostrata (Beaked sedge)
Danthonia intermedia (Timber oatgrass)
Deschampsia caespitosa (Tufted hairgrass)
Myrica gale (Sweetgale)
Salix spp. (Willow)

For palustrine marshes, the following prevalent species are included:

Andropogon gerardii (Big bluestem)
Calamagrostis canadensis (Bluejoint)
Carex spp. (Caric-sedge)
Cyperus spp. (Flat-sedge)
Echinochloa crusgalli (Barnyard grass)
Eleocharis spp. (Spikesedge)

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* Certain Emergent Nonpersistent Wetlands are more properly classified under the Riverine and Lacustrine Systems in the NWI classification scheme.

Hordeum jubatum (Foxtail barley)

Juncus spp. (Rush)

Leersia oryzoides (Rice grass)

Muhlenbergia racemosa (Prairie muhly)

Phragmites australis (Reed)

Scirpus spp. (Bulrush)

Setaria spp. (Foxtail)

For Palustrine marshes, the following common associated species are included:

Amaranthus spp. (Pigweed)

Ambrosia spp. (Ragweed)

Polygonum spp. (Smartweed)

Rumex spp. (Dock)

Sagittaria spp. (Arrowhead)

Sparganium spp. (Bur-reed)

Typha spp. (Cattail)

Xanthium spp. (Cocklebur)

51. Species associations. The following species associations occur:

a. Fens and wet meadows. Fen and wet meadow vegetation is similarly characterized by the abundance of graminoids.

b. Palustrine marshes. Graminoids usually dominate these communities. In the prairie potholes region, graminoids and forbs such as arrowhead and smartweed are frequently present. Some common species in reservoir drawdown areas are pigweed, dock, cocklebur, foxtail barley, foxtail, and ragweed.

Environmental conditions

52. These communities are usually inundated or saturated during the spring. The soils become progressively drier throughout the summer, but the frequent summer precipitation often keeps the substrates moist.

53. Freshwater marshes adjacent to streams, canals, reservoirs, and rivers are normally wet during the spring of each year; whereas, those adjacent to ponds, lakes, and around prairie potholes are commonly inundated only during wet years.

SCRUB-SHRUB WETLANDS AND FORESTED WETLANDS

DEFINITION: The Scrub-Shrub Wetlands class includes areas dominated by woody vegetation less than 6 m (20 ft) in height. The species include true shrubs and trees or shrubs that are small or stunted because of environmental conditions. Scrub-Shrub Wetland includes many of the young tree and shrub species found within Forested Wetlands (Cowardin et al. 1979). The Forested Wetlands class includes areas dominated by woody vegetation equal to or greater than 6 m in height (Cowardin et al. 1979).

54. Within the Forested Wetlands class, NWI includes five subclasses: (a) Broad-leaved Deciduous, (b) Needle-leaved Deciduous, (c) Broad-leaved Evergreen, (d) Needle-leaved Evergreen, and (e) Dead. (For a more detailed description of these subclasses and specific dominance types, the reader is urged to consult Cowardin et al. (1979).) To assist in the field recognition of wetlands, this guide will deviate from the NWI classification system and describe three common wooded wetland associations (riparian swamp, conifer and bog swamps, and shrub carr). These plant communities are included for identification purposes and do not preclude the use of NWI classification, though each of these plant associations could be easily classified under this system.

55. Wooded wetlands are quite common in this region. They frequently occur along sluggish, meandering streams, on floodplains of major rivers, along shallow lakes, and in other low areas. The substrate is often mucky, alluvial, or peaty, and is either periodically inundated or maintains saturated soils at or near the surface for extended periods of time.

Vegetation

56. *Growth form and physiognomy*. These areas are characterized by medium to dense stands of shrubs and/or evergreen or deciduous trees.

57. *Species composition of the wooded wetlands*. The following prevalent species are included:

a. Riparian swamp.

Acer rubrum (Red maple)

Acer saccharinum (Silver maple)

Fraxinus spp. (Ash)

Liquidambar styraciflua (Sweetgum)

Nyssa aquatica (Tupelo)

Populus spp. (Cottonwood)

Quercus macrocarpa (Bur oak)

Quercus palustris (Pin oak)

Salix spp. (Willow)

Taxodium distichum (Bald cypress)

b. Conifer and bog swamps.

Abies balsamea (Balsam fir)

Alnus incana (Speckled alder)

Betula papyrifera (Paper birch)

Fraxinus nigra (Black ash)

Larix laricina (Tamarack)

Picea mariana (Black spruce)

Sphagnum spp. (Sphagnum moss)

Thuja occidentalis (White cedar, Arborvitae)

c. Shrub-carr.

Alnus incana (Speckled alder)

Cephalanthus occidentalis (Buttonbush)

Cornus sericea (Red ozier dogwood)

Salix spp. (Willow)

The following common associated species are included:

a. Riparian swamps.

Acer negundo (Box elder)

Celtis spp. (Hackberry)

Diospyros virginiana (Persimmon)

Juglans nigra (Black walnut)

Platanus occidentalis (Sycamore)

Sapindus drummondii (Soapberry)

b. Conifer and bog swamps.

Acer rubrum (Red maple)
Andromeda polifolia (Bog-rosemary)
Betula alleghaniensis (Yellow birch)
Betula pumila (Swamp birch)
Chamaedaphne calyculata (Leatherleaf)
Kalmia angustifolia (Sheep-kill)
Ledum groenlandicum (Labrador-tea)
Myrica gale (Sweet gale)
Pinus strobus (White pine)
Sorbus americana (Mountain ash)

58. Species associations. Common trees in riparian swamps in the Midwest and Great Plains are willows, elms, ashes, and cottonwoods. Others, which are also widespread but usually not as abundant, are box elder, hackberry, sycamore, black walnut, and persimmon (Braun 1950, Bruner 1931). In the southern plains, soapberry and bur oak also occur quite commonly. Farther east, along the central sections of the Mississippi and its tributaries, silver maple is one of the dominants (Missouri Botanical Garden 1975). Sweetgum, red maple, tupelo, and bald cypress are important species in the southeastern part of the region (Lindsey et al. 1961). Pin oak is important in some Indiana, Illinois, and Missouri floodplain forests (Hosner and Minckler 1963, Missouri Botanical Garden 1975).

59. Understory vegetation in Great Plains and Midwestern riparian swamps varies considerably. Ground cover usually becomes much denser as flooding frequency decreases. In willow forests, which are regularly flooded, few shrubs or herbs survive. Cottonwood and silver maple communities have more understory although total cover of herbs is still low. Elm, ash, and pin oak habitats usually have much greater cover. Common understory plants here include *Elymus canadensis* (Canada wild rye), *Geum* spp. (Avens), *Vitis* (wild grape), *Toxicodendron toxicarium* (poison ivy), and *Laportea canadensis* (nettle) (Burgress, Johnson, and Keammer 1973, Missouri Botanical Garden 1975).

60. Common inhabitants of conifer and bog swamps include

sphagnum moss, black spruce, white cedar, tamarack, balsam fir, black ash, and paper birch (Clausen 1957, Conway 1949, Curtis 1959, Dansereau and Segadas-Vianna 1952, Heinselman 1970). Other common members of this community include white pine, mountain ash, red maple, quaking aspen, yellow birch, and swamp birch.

61. Many shrubs, particularly those of the heath family *(Ericaceae)*, are common on organic soils. Important species include labrador tea, sheep-kill, leatherleaf, and bog-rosemary. Probably the most abundant shrub in conifer and bog swamps is speckled alder. Other frequent inhabitants include buckbean, sweet gale, sedges, bluejoint, and cottongrass.

62. In the Midwest, shrub-size willows, buttonbush, red ozier logwood, and speckled alder dominate the leading edge of many shrub-carr swamps along many ponds, lakes, and rivers. In the Rocky Mountains, willows and speckled alders are the usual dominants on many montane sites (Bierly 1972). These shrub-carrs commonly have a sedge understory. Important herbs here include *Carex stricta* (tussock sedge), *Thelypteris palustris* (marsh fern), and *Impatiens* (spotted touch-me-not) (Curtis 1959, Harrington 1954, Heinselman 1970, and Steyermark 1963).

Environmental conditions

63. Riparian swamp areas are characterized by medium to dense stands of broadleaf or deciduous trees and/or shrubs. Riparian swamps typically are found in floodplains throughout the region. They frequently occur adjacent to lakes, reservoirs, and along drainageways.

64. Riparian swamps are usually seasonally flooded in much of this region. Even though these soils may not remain permanently saturated, the water table is relatively shallow and many plants, even those of the desert southwest, have roots growing into it.

65. Conifer and bog swamps are mostly located in the northern sections of the region. These commonly occur on old lake beds and, less frequently, on floodplains (Curtis 1959). These swamps are treated together since their dominant conifers are found in both communities, even though their soils are different.

66. The water regime and associated parameters are usually quite

distinctive. Standing water is seldom present in conifer and bog swamps. However, since the water tables are normally near the surface (Bay 1967), the soils usually remain saturated for much of the year.

67. Shrub-carrs (Shrub-dominated swamps except those on bogs), commonly found in the upper Midwest and in the Rocky Mountains, are usually dominated by willows and speckled alders.

68. Shrub-carrs occur along streams and rivers and in areas with high water tables and/or saturated soils.

STREAMBED

DEFINITION: The Streambed class includes all wetlands restricted within a channel containing nontidal flowing water for only part of the year. When the water is not flowing, it may remain in isolated pools or surface water may be absent. This class also includes all channels of a river or estuary that are completely dewatered at low tide. Water regimes are restricted to irregularly exposed, regularly flooded, irregularly flooded, seasonally flooded, temporarily flooded, and intermittently exposed (Cowardin et al. 1979).

69. Within the Streambed class, NWI includes seven subclasses: (a) Bedrock, (b) Rubble, (c) Cobble-gravel, (d) Sand, (e) Mud, (f) Organic, and (g) Vegetated. Only the latter subclass will be considered in this guide.

Streambed (Vegetated)

70. The form and substrate of streambeds vary greatly, depending upon the gradient of the channel, the velocity of the water, and the sediment load. Streambeds are usually not vegetated because of the scouring effect of moving water, but they may be colonized by annuals or perennials during periods of low flow (Cowardin et al. 1979).

Vegetation

71. Species composition of Streambeds (Vegetated). The prevalent species found is *Panicum capillare* (Old witchgrass).*

Environmental conditions

72. Vegetated Streambeds are exposed long enough to be colonized by herbaceous annuals or seedling herbaceous perennials (pioneer plants).

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* Cowardin et al. (1979). In addition to this species, those listed as dominants for the Unconsolidated Shores (Vegetated) subclass are also commonly found.

This vegetation, unlike that of Emergent Wetlands, is usually killed by rising water levels or sudden flooding (Cowardin et al. 1979).

UNCONSOLIDATED SHORES

DEFINITION: The Unconsolidated Shores class includes all wetland habitats having the following characteristics: (a) unconsolidated substrates with less than 75 percent areal cover of stones, boulders, or bedrock; (b) less than 30 percent areal cover of vegetation other than pioneering plants; and (c) any of the following water regimes: irregularly exposed, regularly flooded, irregularly flooded, seasonally flooded, temporarily flooded, intermittently flooded, saturated, or artifically flooded (Cowardin et al. 1979).

73. Within the Unconsolidated Shores class, NWI includes five subclasses: (a) Cobble-Gravel, (b) Sand, (c) Mud, (d) Organic, and (e) Vegetated. Only the latter subclass will be considered in this guide.

Unconsolidated Shores (Vegetated)

74. The substrates that characterize unconsolidated shores usually lack vegetation except for pioneering plants that become established during periods of favorable growth conditions. Unconsolidated shores consist of landforms such as beaches, bars, and flats which are created by the erosion and deposition actions of waves and currents (Cowardin et al. 1979).

Vegetation

75. Species composition of Unconsolidated Shores (Vegetated). Prevalent species include:

Chenopodium rubrum (Goosefoot)
Echinochloa crusgalli (Barnyard grass)
Kochia scoparia (Summer cypress)
Xanthium spp. (Cocklebur)*

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* Cowardin et al. (1979).

Environmental conditions

76. Some unconsolidated shores are exposed for a sufficient period to be colonized by herbaceous annuals or seedling herbaceous perennials (pioneer plants). This vegetation, unlike that of Emergent Wetlands, is usually killed by rising water levels and may be gone before the beginning of the next growing season. Many of the pioneer species are not hydrophytes but are weedy mesophytes that cannot tolerate wet soil or flooding (Cowardin et al. 1979).

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APPENDIX A: COMMON AND SCIENTIFIC NAMES OF PLANTS OF THE INTERIOR UNITED STATES

Common/Scientific Names*

Alkali grass
Puccinellia nuttalliana (Schult.) Hitchc.
Alkali sacaton
Sporobolus airoides (Torr.) Torr.
American milfoil
Myriophyllum exalbescens Fern.
Annual sunflower
Helianthus annuus L.
Arrowgrass
Triglochin maritima L.
Arrowhead
Sagittaria spp.
Ash
Fraxinus spp.
Avens
Geum spp.
Bald cypress
Taxodium distichum (L.) Rich.
Balsam fir
Abies balsamea (L.) Mill.
Barnyard grass
Echinochloa crusgalli (L.) Beauv.
Beaked sedge
Carex rostrata Stokes ex With.
Big bluestem
Andropogon gerardii Vitman
Black ash
Fraxinus nigra Marsh.
Black greasewood
Sarcobatus vermiculatus (Hook.) Torr.
Black spruce
Picea mariana (Mill.) B. S. P.
Black walnut
Juglans nigra L.
Bluejoint
Calamagrostis canadensis (Michx.) Beauv.
Bog-laurel
Kalmia polifolia Wang.

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* These plants are listed alphabetically by scientific name (beginning on page A6.

Bog-rosemary
Andromeda polifolia L. var. *glaucophylla* (Link) DC.
Box elder
Acer negundo L.
Buckbean
Menyanthes trifoliata L.
Bulltule
Scirpus robustus Pursh
Bulrush
Scirpus spp.
Bur oak
Quercus macrocarpa Michx.
Bur-reed
Sparganium spp.
Bur-sage
Ambrosia ambrosioides (Cav.) Payne
Buttonbush
Cephalanthus occidentalis L.
Canada wild rye
Elymus canadensis L.
Caric-sedge
Carex lasiocarpa Ehrh.
Caric-sedge
Carex spp.
Carpetweed
Mollugo verticillata L.
Cattail
Typha spp.
Cocklebur
Xanthium spp.
Cottongrass
Eriophorum spp.
Cottonwood
Populus spp.
Creeping love-grass
Eragrostis hypnoides (Lam.) B. S. P.
Dock
Rumex spp.
Duck-meat
Spirodela spp.
Duckweed
Lemna spp.
Flat-sedge
Cyperus spp.
Foxtail
Setaria spp.
Foxtail barley
Hordeum jubatum L.
Giant ragweed
Ambrosia trifida L.

Glasswort
Salicornia rubra Nels.
Goosefoot
Chenopodium rubrum L.
Hackberry
Celtis spp.
Horned pondweed
Zannichellia palustris L.
Hornwort
Ceratophyllum demersum L.
Iodine bush
Allenrolfea occidentalis (Wats.) Ktze.
Labrador-tea
Ledum groenlandicum Oeder
Leafy pondweed
Potamogeton foliosus Raf.
Leatherleaf
Chamaedaphne calyculata (L.) Moench
Marsh fern
Thelypteris palustris Schott
Marsh marigold
Caltha leptosepala DC.
Monkey flower
Mimulus ringens L.
Mountain ash
Sorbus americana (Marsh.)
Muskgrass
Chara spp.
Naiad
Najas spp.
Nettle
Laportea canadensis (L.) Wedd.
Old witchgrass
Panicum capillare L.
Paper birch
Betula papyrifera Marsh.
Persimmon
Diospyros virginiana L.
Pickleweed
Salicornia spp.
Pigweed
Amaranthus spp.
Pin oak
Quercus palustris Muenchh.
Pitcher plant
Sarracenia purpurea L.
Poison ivy
Toxicodendron toxicarium (Salisb.) Gillis
Prairie cordgrass
Spartina pectinata Link

Prairie muhly
Muhlenbergia racemosa (Michx.) B. S. P.
Quaking aspen
Populus tremuloides Michx.
Ragweed
Ambrosia spp.
Red maple
Acer rubrum L.
Red ozier dogwood
Cornus sericea L. ssp. *occidentalis* (Torr. and Gray) Fosberg
Reed
Phragmites australis (Cav.) Trin. ex Steud.
Rice cutgrass
Leersia oryzoides (L.) Sw.
Rush
Juncus spp.
Russian thistle
Salsola kali L.
Sago pondweed
Potamogeton pectinatus L.
Salt-cedar
Tamarix spp.
Saltgrass
Distichlis spicata (L.) Greene var. *stricta* (Torr.) Beetle
Saltwater bulrush
Scirpus maritimus L.
Sea blite
Suaeda depressa (Pursh) Wats.
Sea purslane
Sesuvium verrucosum Raf.
Sheep-kill
Kalmia angustifolia L.
Silver maple
Acer saccharinum L.
Small white morning-glory
Ipomoea lacunosa L.
Smartweed
Polygonum spp.
Soapberry
Sapindus drummondii H. and A.
Speckled alder
Alnus incana (L.) Moench spp. *rugosa* (Du Roi) Clausen
Sphagnum moss
Sphagnum spp.
Spikesedge
Eleocharis rostellata (Torr.) Torr.
Spikesedge
Eleocharis spp.
Spotted touch-me-not
Impatiens capensis Meerb.

Stoneworts
Nitella spp.
Stoneworts
Tolypella spp.
Sundew
Drosera rotundifolia L.
Summer cypress
Kochia scoparia (L.) Schrad.
Swamp birch
Betula pumila L.
Swamp loosestrife
Decodon verticillatus (L.) Ell.
Sweet gale
Myrica gale L.
Sweetgum
Liquidambar styraciflua L.
Sycamore
Platanus occidentalis L.
Tamarack
Larix laricina (Du Roi) K. Koch
Threesquare bulrush
Scirpus americanus Pers.
Timber oatgrass
Danthonia intermedia Vasey
Tufted hairgrass
Deschampsia caespitosa (L.) Beauv.
Tupelo
Nyssa aquatica L.
Tussock sedge
Carex stricta Lam.
Watermilfoil
Myriophyllum spp.
Water sedge
Carex aquatilis Wahl.
Waterweed
Elodea spp.
White cedar
Thuja occidentalis L.
White pine
Pinus strobus L.
Widgeon grass
Ruppia maritima L.
Wild celery
Vallisneria americana Michx.
Wild grape
Vitis spp.
Willow
Salix spp.
Wooly sedge
Carex lanuginosa Michx.

Yellow birch
Betula alleghaniensis Britt.
Yellow nutgrass
Cyperus esculentus L.

Scientific/Common Names

Abies balsamea (L.) Mill.
Balsam fir
Acer negundo L.
Box elder
Acer rubrum L.
Red maple
Acer saccharinum L.
Silver maple
Allenrolfea occidentalis (Wats.) Ktze.
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Celtis spp.
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Sundew
Echinochloa crusgalli (L.) Beauv.
Barnyard grass
Eleocharis rostellata (Torr.) Torr.
Spikesedge
Eleocharis spp.
Spikesedge
Elodea spp.
Waterweed
Elymus canadensis L.
Canada wild rye
Eragrostis hypnoides (Lam.) B. S. P.
Creeping love-grass
Eriophorum spp.
Cottongrass
Fraxinus nigra Marsh.
Black ash
Fraxinus spp.
Ash

Geum spp.
Avens
Helianthus annuus L.
Annual sunflower
Hordeum jubatum L.
Foxtail barley
Impatiens capensis Meerb.
Spotted touch-me-not
Ipomoea lacunosa L.
Small white morning-glory
Juglans nigra L.
Black walnut
Juncus spp.
Rush
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Nitella spp.
Stonewort

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Sago pondweed
Puccinellia nuttalliana (Schult.) Hitchc.
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Widgeon grass
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Taxodium distichum (L.) Rich.
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Toxicodendron toxicarium (Salisb.) Gillis
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Wild celery
Vitis spp.
Wild grape
Xanthium spp.
Cocklebur
Zannichellia palustris L.
Horned pondweed

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Preliminary guide to the onsite identification and delineation of the wetlands of the interior United States / Environmental Laboratory, U.S. Army Engineer Waterways Experiment station. -- Vicksburg, Miss. : The Station ; Springfield, Va. : available from NTIS, 1982.
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